will be due Sunday

- A webwork assignment will be posted soon (most likely Tuesday), & you'll get an Blackboard announcement when that happens.

MTH 218

- Read 10.2 before Wednesday

10C

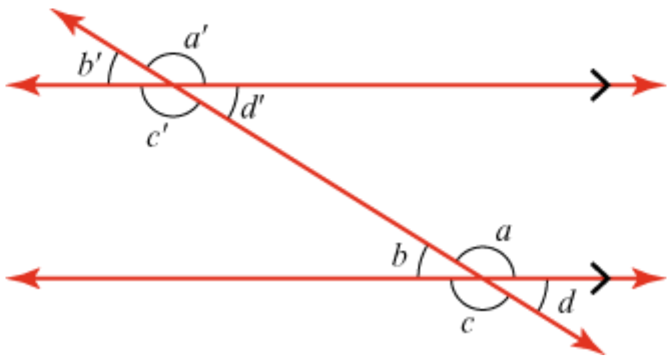
Class Activity 10C Angles Formed When a Line Crosses Two Parallel Lines

p202

CCSS CCSS SMP3, 8.G.5

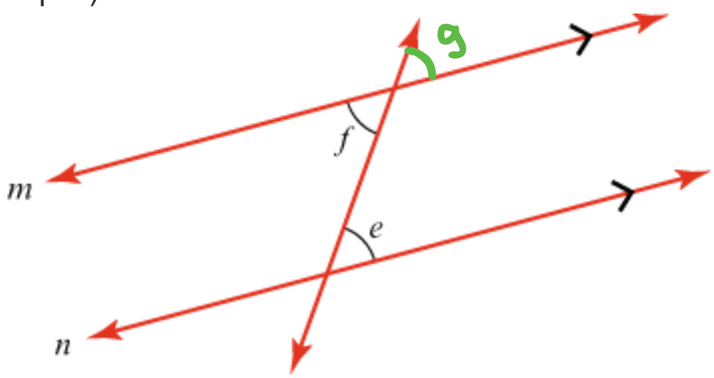
A pair of lines marked with arrows indicates that the lines are parallel.

Given 2 parallel lines and a transversal line that crosses the 2 parallel lines, as shown below, the Parallel Postulate says that $a = a'$, $b = b'$, $c = c'$, and $d = d'$.

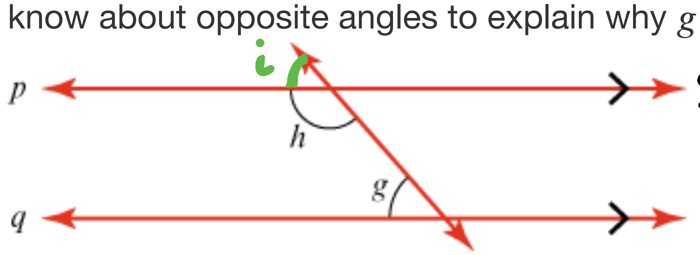


1. Given that lines *m* and *n* are parallel, use the Parallel Postulate and what we know about opposite angles to explain why $e = f$ (alternate interior angles are equal).

By Parallel Postulate,
$e = g$.
The opposite angles $f = g$.
So ~~e=f=g~~ $e = g = f$
So $e = f$.



2. Given that lines *p* and *q* are parallel, use the Parallel Postulate and what we know about opposite angles to explain why $g + h = 180°$.



Since $i = g$
and $i + h = 180°$

So $g + h = 180°$.

//

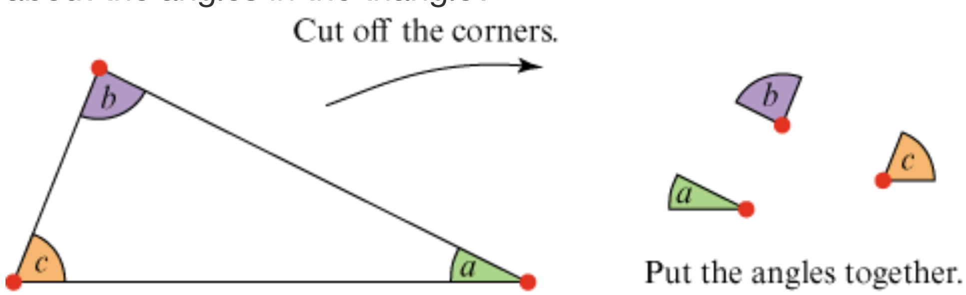
CCSS CCSS SMP3, 8.G.5

10D

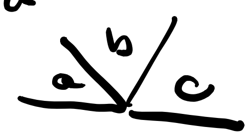
You will need a ruler and scissors for this activity.

Work with a group of people. Each person in your group should do the following:

1. Using a ruler, draw a large triangle that looks different from the triangles of other group members. Cut out your triangle. Label the three angles *a*, *b*, and *c*.
2. Tear or cut all 3 corners off your triangle. Then put the angles together vertex to vertex, without overlaps or gaps. What do you notice? What does this show you about the angles in the triangle?



we get $a+b+c=180°$



3. Discuss why the "putting the angles together" method of part 2 is not a proof. Consider these points:
   - Does the method show *exactly* how the angles are related?
   - Has every triangle been considered?

It looks like $a+b+c=180°$, but we can't tell from this activity that they equal exactly 180°

No, we have only considered 1 triangle.

Class Activity 10E Drawing a Parallel Line to Prove That the Angles in a Triangle Add to 180°

10E

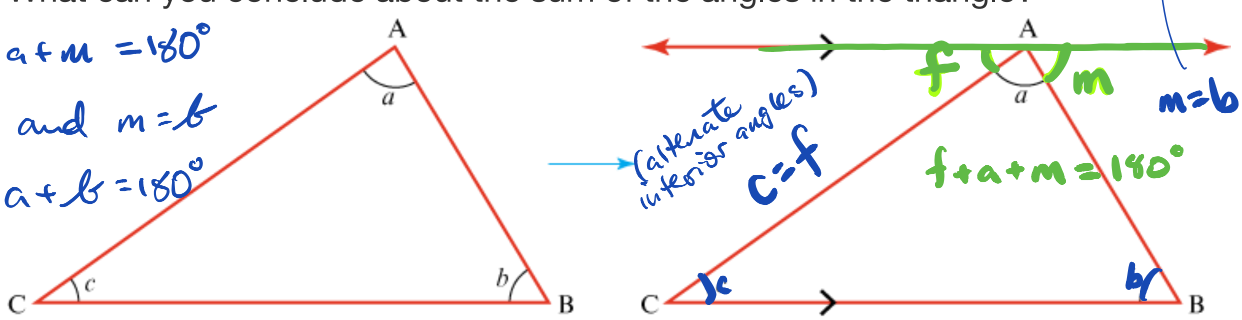
CCSS CCSS SMP3, 8.G.5

This activity will show you a way to prove that the angles in a triangle add to 180°.

1. Given any triangle with (corner) points A, B, and C, let *a*, *b*, and *c* be the angles of the triangle at A, B, and C, respectively. Consider the line through A parallel to the side BC that is opposite A.
   What can you say about the 3 adjacent angles at A that are formed by the triangle and the line through A?
   What can you conclude about the sum of the angles in the triangle?

- also alternate interior angles (see p202)

So if $f+a+m=180°$
and $f=c$ and $m=b$
then $c+a+b=180°$



Draw a line parallel to BC through A.

2. What if you used a different triangle in part 1? Would you still reach the same conclusion?

10.1 Lines and Angles

Common Core State Standards Grades 2, 4, 7, 8

Geometry gives us tools to mathematize and model aspects of the world around us. For example, think about traveling from one location to another. We might think of the two locations as two points, and we might think of a direct route from one location to the other as a line segment connecting the two points. When we use geometry to model a situation, we often make a math drawing that captures key elements of the situation and shows how those elements are related. We might represent the situation with lines and points and we might analyze the situation by reasoning about lengths of line segments and sizes of angles. In this section we will study some fundamental concepts in geometry, which are especially valuable for modeling navigation, and which will also help us describe and analyze geometric shapes.

What Are Points, Lines, Line Segments, Rays, and Planes?

The terms *point*, *line*, and *plane* are usually considered primitive, undefined terms. Even so, we can describe how to think about and visualize points, lines, and planes (see **Figure 10.1**):

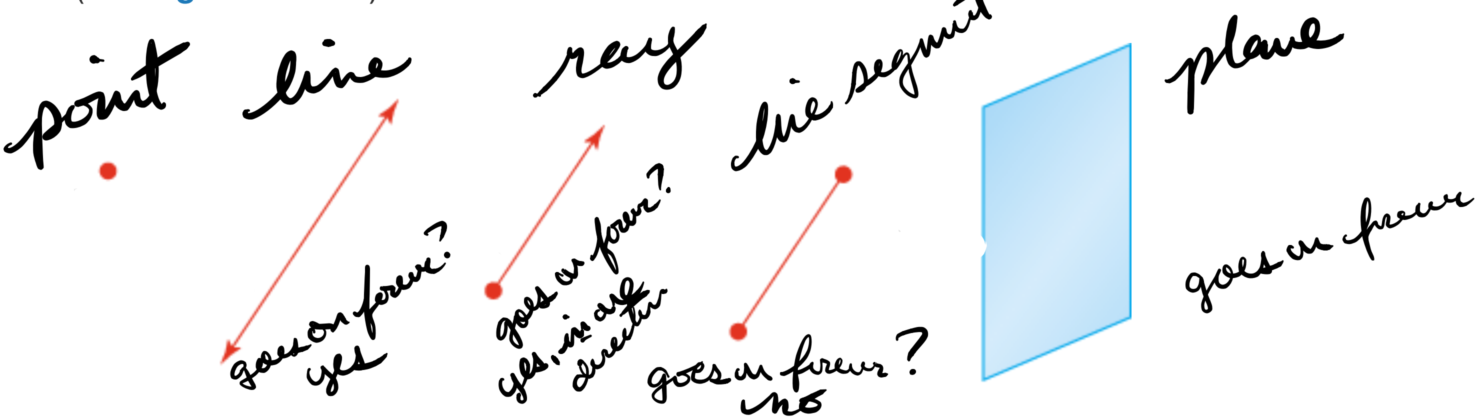


Figure 10.1 Points, lines, planes. Arrow heads indicate that the line or ray extends indefinitely in that direction.

- To visualize a **point**, think of a tiny dot, such as the period at the end of a sentence. A point is an idealized version of a dot, having no size or shape.
- To visualize a **line**, think of an infinitely long, stretched string that has no beginning or end. A line is an idealized version of such a string, having no thickness.
- To visualize a **plane**, think of an infinite flat piece of paper that has no beginning or end. A plane is an idealized version of such a piece of paper, having no thickness.

CCSS
4.G.1

When two lines in a plane intersect, they form four angles. **Figure 10.9** shows some examples. When all four of the angles are 90°, we say that the two lines are **perpendicular**.

> ***perpendicular***

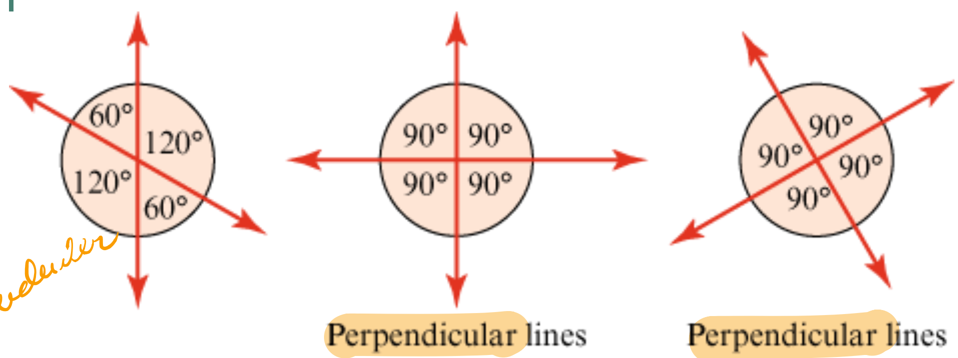


Figure 10.9 Two lines meeting at a point form 4 angles.

Two lines in a plane that *never* intersect (even somewhere far off the page they are drawn on) are called parallel **Figure 10.10** shows examples of lines that are parallel and lines that are not parallel, even though you can't see where they meet. We often label parallel lines with arrows, as in **Figure 10.10** (a) and (b).

> ***parallel***

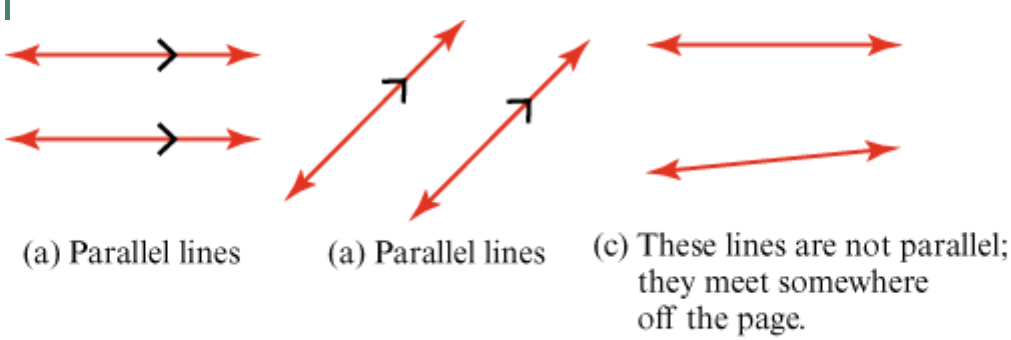


Figure 10.10 Parallel lines and lines that are not parallel.

> Class Activity
> 10A Folding Angles, p. CA-200

We can add the measures of angles that are next to each other and don't overlap. **Supplementary angles** are angles that add to 180°. **Complementary angles** are angles that add to 90°.

> ***supplementary angles*** add to 180°
>
> ***complementary angles*** add to 90°

P460

what is a 360°? a full spin

Practice Exercises for Section 10.1

1. My son once told me that some skateboarders can do "ten-eighties." I said he must mean 180s, not 1080s. My son was right, some skateboarders can do 1080s! What is a 1080, and why is it called that? By contrast, what would a 180 be?

3 complete revolutions

half spin.

$360° \times 3 = 1080°$

2. Use a protractor to measure the angles formed by the shape in **Figure 10.19** .

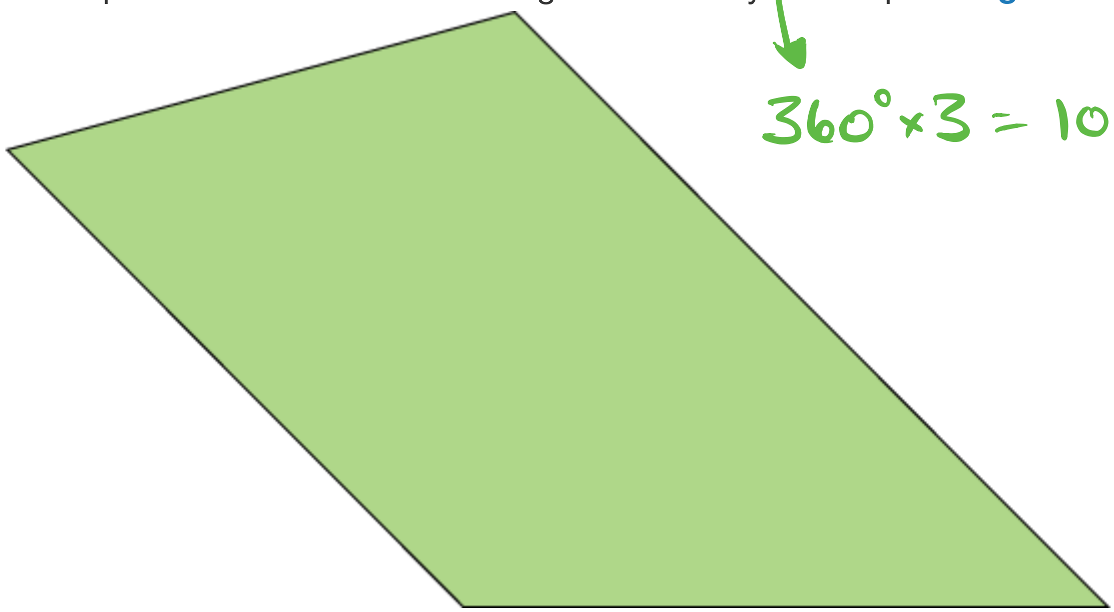
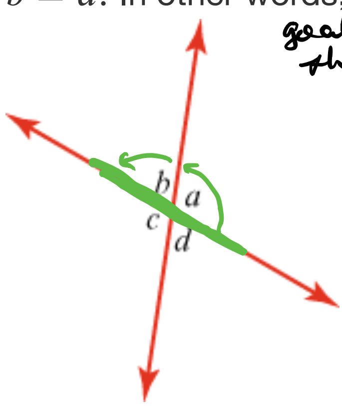


Figure 10.19 Measure the angles.

3. Suppose that two lines in a plane meet at a point, as in **Figure 10.20** . Use the fact that the angle formed by a straight line is 180° to explain why $a = c$ and $b = d$. In other words, prove that opposite angles are equal.



goal: show $a = c$

$a + b = 180°$

$a = 180° - b$ (subtract b)

$c + b = 180°$

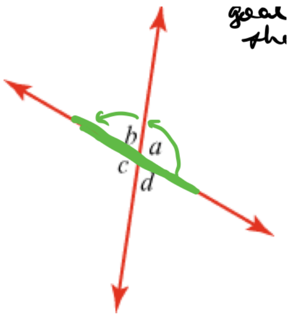
$c = 180° - b$ (subtract b)

$a = 180° - b = c$ so $\boxed{a = c}$

Figure 10.20 Lines meeting at a point.

4. Given that the indicated lines in **Figure 10.21** are parallel, determine the unknown angles without actually measuring them. Explain your reasoning briefly.

3) (continued) Prove $b = d$.



$b + a = 180°$ $\quad$ $a + d = 180°$

(subtract a) $\quad$ (subtract a)

$b = 180° - a$ $\quad$ $d = 180° - a$

Since b and d both equal $180° - a$, thus $b = d$.

4. Given that the indicated lines in **Figure 10.21** are parallel, determine the unknown angles without actually measuring them. Explain your reasoning briefly.

this is because the angles of a triangle add to 180° (interior)

$\boxed{h + c + q = 180°}$

$h = 180° - c - q$
$= 180° - 70° - 68°$
$= 42°$

$d = 180° - a$
$= 180° - 70°$
$= 110°$

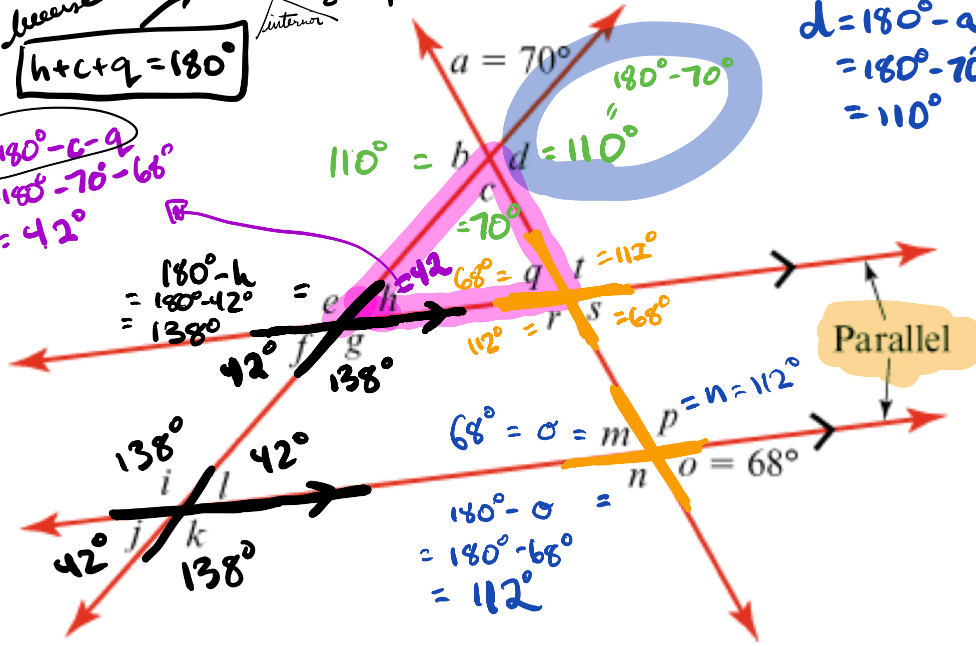
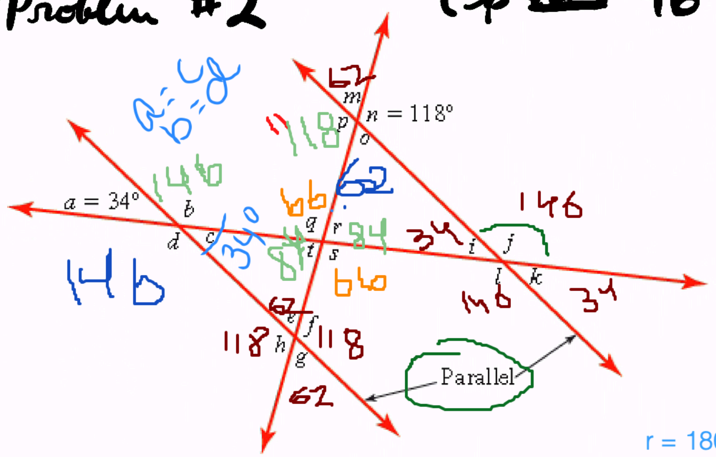


Figure 10.21 Find all angles.

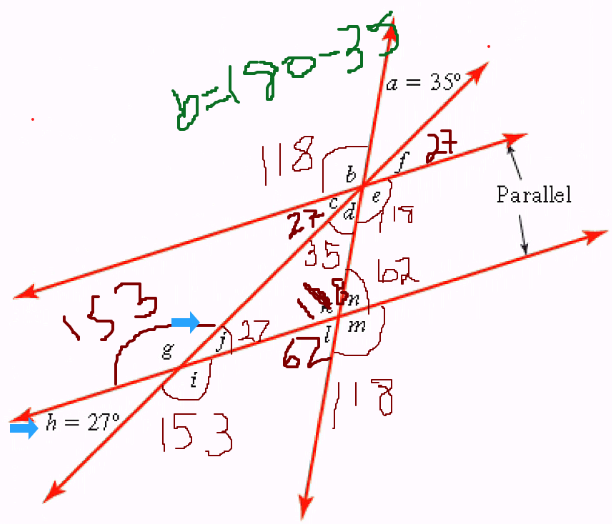
10.1 Problem #2 (p~~463~~ 464)

j = h
Pt. 0



r = 180 - o - t = 180 - 62 - 34 = 84

(a)



(b)